

# CRUISE REPORT 7/98

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## R.V. Prince Madog:

S. Duckworth	Captain
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H. Owen	Second Engineer
P. Jones	Bosun
T. Roberts	Able Seaman
P.D. Williams	Able Seaman/Steward

## Time Breakdown:

Sailed from Menai Bridge	10.00	14.7.98
Arrived at first station	11.30	15.7.98
Left last station	14.40	16.7.98
Arrived at Menai Bridge	09.30	17.7.98

## 1. Abstract

This cruise was the first of many to be carried out in the next three years in support of the NERC funded project 'Holocene palaeoceanography of shelf seas: long-term ( $10^3$ - $10^4$  years) seasonal stratification'. The objectives of this cruise were to sample at a range of sites in the Celtic Sea as reconnaissance for the seasonal study of the infaunal distribution of foraminifera and the environmental factors controlling this. Grab-samples were deployed at 9 sites and multicores attempted at 8. CTD data was also collected through the water column at these sites as were bottom water samples for oxygen isotope measurements. In addition surface and water-column plankton tows were carried out. Sites were selected on the basis of previous cruises and on the suitability of the sediments for multicoring as evidenced by a shipek grab-sample. The longest multicore at each station was subsampled for foraminifera, grainsize and organic carbon analyses. A second core was subsampled for caesium and dinoflagellate measurements and the remaining cores (if any) were sampled at the surface for foraminifera.

## **2. Introduction**

### **a. Scientific aims of project**

This cruise was run as part of a NERC funded project entitled 'Holocene palaeoceanography of shelf seas: long-term ( $10^3$  -  $10^4$  years) seasonal stratification dynamics. The aim of this project is to generate a record of environmental change relating to development of seasonally stratified water in the Celtic Sea during the Holocene.

### **b. Specific cruise objectives**

The aim of the cruise was to collect multicores from a range of sites for a preliminary assessment of their suitability for a 3 year study of changes in the seasonal vertical distribution of benthic foraminifera to be determined on the basis of faunal composition and environmental conditions at each site. An additional aim was to collect plankton samples from the surface waters at these sites for dinoflagellate analysis and throughout the water column for planktonic foraminiferal analysis.

### **c. Narrative of cruise**

The R.V. Prince Madog sailed from Menai Bridge at 10.00 on 15.7.98 in windy conditions having been delayed by bad weather during the previous 24 hours. Weather conditions remained poor during the steam to the Celtic Sea area and it was decided to put anchor off Rosslare Harbour for the night rather than proceed to the first station. By morning conditions had improved and the first station, of the 10 proposed stations in the Celtic Deep area, was reached by 11.30 on 16.7.98.

The CTD was the first instrument deployed. This was fitted with a rosette system for water collection triggered to close at the point at which the CTD was closest to the seabed. Water collected in this way was subsampled for calibration of the CTD and oxygen isotope measurements. Attached to the bottom of the CTD was a large plankton net which was drawn through most of the water column at the station. The water collected was funnelled in to a collection bottle for foraminiferal analysis. A smaller net was filled with surface water using the ships pumped water. This sample was then poisoned and preserved using lugol then stored in collection bottles for dinoflagellate analysis.

A day grab was twice unsuccessfully deployed. The third, successful attempt was with the shipek grab. The sediment collected was very shelly in nature and deemed too coarse to risk the multicorer.

The second station was reached at 13.57. There sampling was carried out as described above. This time the sediment was finer grained though some shelly material was visible. A multicore was deployed and 3 cores were returned intact. Cores were extruded using a purpose-built stand. The first was sliced to 0.5 cms and then at 1 cm intervals to 25.5 cms or to the end where the core was too short. Each sliced was halved and one half stained with rose Bengal and preserved in ethanol. The remaining halves were quartered for grainsize analysis and organic carbon measurements. The latter samples were frozen. The second core was sliced in the same way. The surface slice was halved for dinoflagellate analysis, the

remainder stored for caesium measurement as were all the subsequent slices. The third core was sampled for the first 0.5 cm only and this was stored in rose Bengal and ethanol for foraminiferal analysis.

At the third station the multicore catcher was broken limiting the number of cores possible subsequently. As a result of this and problems with the core bungs only one of the cores was sampled from this site for foraminifera, grainsize and organic carbon in the way described above.

All the subsequent sites were similarly sampled for CTD measurements, oxygen isotopes, foraminifera, grainsize, organic carbon, caesium and dinoflagellates. When a third core was available it was sampled at the surface for foraminifera.

Sampling continued until site 8 was sampled on 16.7.98 by which time the ship had begun to steam north towards the Welsh coast to avoid incoming bad weather. It had been elected to abandon attempts at two of the proposed stations so as to reach shelter before the 'window' of good weather was lost. The final station, 9, was situated south of the Lley in an area known as Muddy Hollow. This was reached at 14.16 on 16.7.98 and sampled in the same way as at the other sites.

The ship continued the steam home and put anchor off Moelfre for the night of the 16.7.98 before sailing into Menai Bridge at around 09.30 on 17.7.98.

### **3. CTD Operations**

The CTD, a Neil Brown system, was used to collect data on salinity, temperature, pressure and oxygen concentration. Unfortunately the oxygen sensor had not yet been calibrated so the oxygen data produced was qualitative rather than quantitative. All other the sensors appeared to work well. A total of 9 CTD casts were made.

The CTD system was fitted with a rosette water sampling system and this was triggered to collect at the deepest point of the drop, usually 10 m from the sea bed. The water collected was used for calibration of the CTD and for oxygen isotope measurement. The calibration bottles for the CTD were rinsed out in the collected water and then filled to the neck. The bottles for oxygen isotope measurements were filled using a piece of tubing inserted into the bottle right to the bottom. The bottle was allowed to fill from the bottom, while swirling the tube around to remove as many air bubbles as possible. The bottle was allowed overfill until three times its capacity of water has passed through it then the tubing was slowly lifted out and the cap screwed on. The bottles were stored in the fridge.

### **4. Sediment collection**

Both a day-grab and a shipek grab were carried on board but after early problems with the day-grab it was the shipek which was used to collect surface samples. These samples were preserved in ethanol and stained with rose Bengal for foraminiferal analysis. They were also examined visually for grainsize to determined whether the site was sufficiently fine grained to deploy the multicorer.

The multicorer system consists of four core tube, core catchers and a hydraulic coring system mounted in a bell-shaped frame. After attaching the cores, catchers and additional weights and priming the system on deck, the core was winched overboard to the seabed where the cores slowly enter the sediment taking a relatively undisturbed core with a good sediment-water contact. Once the corer was back on deck the core catchers were removed and the cores bunged. The cores were taken out of their holds and placed in a cradle to await further sampling.

Of the returned cores the longest was sectioned at 0.5 then 1 cm intervals down to 25.5 cm or the end of the core where it was shorter than this. Each circular section, as it was extracted, was halved then one half quartered. The half section was stored in a 250 ml sampling bottle with an equal quantity of ethanol and approximately 10 - 20 ml of rose Bengal solution. The quarter sections were stored in plastic bags, one for grain size and the other for organic analyses. The latter samples were frozen.

A second core was sampled at the above intervals. The top slice (0 - 0.5 cm) was halved, one half for storage in rose Bengal and ethanol and for subsequent foraminiferal analysis and the other in bags for caesium measurements. The slices between 0.5 - 25.5 (or the end of the cores shorter than 25.5) were also stored for caesium analysis.

The remaining cores were sampled to 0.5 cm only for foraminiferal analysis and were stored as already described.

## **5. Plankton samples**

A large plankton net was attached to the underside of the CTD so that water collected would come from the entire length of the water column at each site, excepting the last few metres. The samples collected in this way were sieved on a 63  $\mu\text{m}$  mesh then washed into a collection bottle and stained with rose Bengal (?) for foraminiferal analysis.

A smaller plankton net was washed through for a couple of minutes with surface water pumped by the ship. The samples were then collected in small bottles and poisoned with lugol for dinoflagellate analysis.

## **6. Equipment problems**

Problems were experienced with the day-grab at the first site where two attempts failed to produce any sediment. This was attributed to the poor closure of the grab and it was decided to use the shipek.

A number of breakages occurred on the cruise which limited the number of samples. One of the core catchers shattered during deployment on the third station so that at the numbers of cores possible was reduced from 4 to 3. Several core tubes were also broken while attempting to extrude the sediment as the bungs did not fit them easily. The extruder was also damaged but was still functional.

## 7. Station log

Station no.	Sampling	Date	Time	Latitude	Longitude	Depth	Comments
Site 1	CTD	15.7.98	11.30	51 50.61	06 00.59	109	
	Grab		11.39	51 50.94	06 00.42	109	N/S
	Grab		11.44	51 51.06	06 00.33	109	N/S
	Grab		11.51	51 51.27	06 00.24	107	N/S
	Grab		12.00	51 51.52	06 00.10	107	
Site 2	Grab		13.57	51 39.92	06 11.57	107	
	MultiC		14.13	51 40.16	06 11.22	107	
	CTD		14.22	51 40.23	06 11.04	112	
Site 3	CTD		15.09	51 38.07	06 13.40	99	
	Grab		15.20	51 38.15	06 13.23	99	
	MultiC		15.35	51 38.20	06 12.99	99	N/S
	MultiC		15.46	51 38.21	06 12.81	99	N/S
	MultiC		16.02	51 38.18	06 12.54	99	
Site 4	CTD		18.30	51 21.81	06 30.59	85	
	Grab		18.39	51 21.86	06 30.45	85	
	MultiC		18.49	51 21.90	06 30.21	85	
Site 5	CTD		20.46	51 12.94	06 09.69	102	
	Grab		20.58	51 13.05	06 09.44	104	
	MultiC		21.06	51 13.12	06 09.32	104	
Site 6	CTD		22.25	51 14.53	05 54.36	93	
	Grab		22.35	51 14.65	05 54.19	93	
	MultiC		22.44	51 14.79	05 54.17	93	N/S
	MultiC		22.52	51 14.93	05 54.09	93	N/S
	MultiC		23.03	51 15.13	05 54.08	93	
Site 7	CTD		23.55	51 17.21	06 04.03	100	
	Grab	16.7.98	00.10	51 17.60	06 04.14	100	
	MultiC		00.16	51 17.80	06 04.14	100	
Site 8	CTD		02.12	51 30.08	05 49.39	86	
	Grab		02.29	51 30.43	05 49.76	86	
	Grab		02.39	51 30.55	05 49.92	86	N/S
	MultiC		02.42	51 30.60	05 49.95	88	
Site 9	Grab		14.16	52 44.95	04 28.02	31	
	MultiC		14.21	52 44.93	04 28.03	32	core 1
	MultiC		14.27	52 44.96	04 28.04	32	core 2
	CTD		14.33	52 44.91	04 27.98	32	